Mr. Michael T. Davis Pre-Calculus	2.4 Solving & Writing Equations with Irrational & Imaginary Zeros (2) December 13, 2016

Name: Solutions

Solve each equation, which has either irrational zeros or Imaginary Zeros or both:

1. Solve $x^2+25=0$

$x^2 = -25$

$\sqrt{x^2} = \pm\sqrt{-25}$

$x = \pm i\sqrt{25}$

$x = \pm i \cdot 5$

$\{5i, -5i\}$

2. Solve $y^2-21=0$

$y^2 = 21$

$\sqrt{y^2} = \pm\sqrt{21}$

$y = \pm\sqrt{21}$

$\{\sqrt{21}, -\sqrt{21}\}$

3. Solve $k^2-18=0$

$K^2 = 18$

$\sqrt{K^2} = \pm\sqrt{18}$

$K = \pm\sqrt{9\cdot 2}$

$K = \pm 3\sqrt{2}$

$\{3\sqrt{2}, -3\sqrt{2}\}$

4. Solve $p^2+2p-2=0$

$p = \frac{-2 \pm \sqrt{2^2-4(1)(-2)}}{2(1)} = \frac{-2 \pm \sqrt{4+8}}{2} = \frac{-2 \pm \sqrt{12}}{2} = \frac{-2 \pm \sqrt{4\cdot 3}}{2}$

$= \frac{-2 \pm 2\sqrt{3}}{2} = -1 \pm \sqrt{3}$

$\{-1+\sqrt{3}, -1-\sqrt{3}\}$

5. Solve $2w^3-12w^2+20w=0$

$2w(w^2-6w+10)=0$

$2w=0$ $\quad w = \frac{6 \pm \sqrt{(-6)^2-4(1)(10)}}{2} = \frac{6 \pm \sqrt{36-40}}{2} = \frac{6 \pm \sqrt{-4}}{2}$

$w=0$

$= \frac{6 \pm i\sqrt{4}}{2} = \frac{6 \pm i2}{2} = 3 \pm i$

$\{0, 3+i, 3-i\}$

10. Solve $p^4 + 4p^2 - 45 = 0$

$(p^2+9)(p^2-5)=0$

$p^2+9=0 \quad p^2-5=0$

$p^2=-9 \quad p^2=5$

$p=\pm\sqrt{-9} \quad p=\pm\sqrt{5}$

$p=\pm i\sqrt{9}=\pm 3i$

$\{3i, -3i, \sqrt{5}, -\sqrt{5}\}$

Write an equation (in standard form) of the polynomial function with the given zeros:

11. The solution set is $\{2i, -2i\}$, and the polynomial has degree 2

$x=2i \quad x=-2i$

$x-2i=0 \quad x+2i=0$

$(x-2i)(x+2i)=0$

$x^2+2ix-2ix-4i^2=0$

$x^2-4(-1)=0$

$x^2+4=0$

12. The solution set is $\{0, \sqrt{11}, -\sqrt{11}\}$, and the polynomial has degree 3

$x=0 \quad x=\sqrt{11} \quad x=-\sqrt{11}$

$x=0 \quad x-\sqrt{11}=0 \quad x+\sqrt{11}=0$

$x(x-\sqrt{11})(x+\sqrt{11})=0$

$x(x^2-\sqrt{121})=0$

$x(x^2-11)=0$

$x^3-11x=0$

13. The solution set is $\{2\sqrt{2}, -2\sqrt{2}, 6i, -6i\}$, and the polynomial has degree 4

$x=2\sqrt{2} \quad x=-2\sqrt{2} \quad x=6i \quad x=-6i$

$x-2\sqrt{2}=0 \quad x+2\sqrt{2}=0 \quad x-6i=0 \quad x+6i=0$

$(x-2\sqrt{2})(x+2\sqrt{2})(x-6i)(x+6i)=0$

$(x^2+2\sqrt{2}x-2\sqrt{2}x-8)(x^2+6ix-6ix-36i^2)=0$

$(x^2-8)(x^2-36(-1))=0$

$(x^2-8)(x^2+36)=0 \quad x^4+28x^2-288=0$

6. Solve $m^3-8=0$

$(m-2)(m^2+2m+4)=0$

$m-2=0$ $\quad m=2$

$m=\frac{-2\pm\sqrt{(2)^2-4(1)(4)}}{2(1)}=\frac{-2\pm\sqrt{4-16}}{2}=\frac{-2\pm\sqrt{-12}}{2}$

$m=\frac{-2\pm i\sqrt{12}}{2}=\frac{-2\pm 2i\sqrt{3}}{2}=-1\pm i\sqrt{3}$

$\{2,-1+i\sqrt{3},-1-i\sqrt{3}\}$

7. Solve $k^3+27=0$

Do like #6 above

8. Solve $2m^3+98m=0$

$2m(m^2+49)=0$

$2m=0$ $\quad m=0$

$m^2+49=0$

$m^2=-49$

$\sqrt{m^2}=\sqrt{-49}$

$m=\pm i\sqrt{49}$ $\quad m=\pm i7$

$\{0,7i,-7i\}$

9. Solve $x^3-4x^2+9x-36=0$

$x^2(x-4)+9(x-4)=0$

$(x-4)(x^2+9)=0$

$x-4=0$ $\quad x=4$

$x^2+9=0$

$x^2=-9$

$x=\pm\sqrt{-9}$

$x=\pm i\sqrt{9}$

$x=\pm i\cdot 3$

$\{4,3i,-3i\}$